

THE GENUS SPARAXIS

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ABSTRACT

The history of the genera *Sparaxis* and *Streptanthera* is outlined. It is proposed that *Streptanthera* be incorporated in *Sparaxis*. A taxonomic treatment follows. Six species and three subspecies are described. Of the latter, two are new combinations and one is a new subspecies. The cytology of species of *Sparaxis* and related genera is described and this is related to the taxonomy and phylogeny of the genus. The geographical distribution and hybridisation in *Sparaxis* are briefly discussed and a list of doubtful and excluded species is provided for reference.

INTRODUCTION

The genus *Sparaxis*, a member of the family Iridaceae comprises a small group of species endemic to the South Western Cape. Although it consists of only a few species it is much in need of revision and clarification for it is very poorly understood. The existing literature and the standard references for *Sparaxis* and for *Streptanthera*, a genus which it is proposed be incorporated in *Sparaxis*, are quite inadequate as all the species have been misunderstood or misinterpreted. This is because of a lack of information in the past, particularly of a knowledge of the living plants. Owing to the confusion many specimens in herbaria are incorrectly named even according to present systems of classification. The revision may also be of value to the horticultural world, as many of the species are very attractive and are extensively cultivated in South Africa and in America and Europe, where many hybrids are now being produced. In addition to examination of living and pressed plants, a cytological investigation was undertaken to ascertain whether chromosomal studies would be of taxonomic value or reveal any relationships between this and related genera.

MATERIALS AND METHODS

The living plants were examined both under natural conditions and in cultivation. Wherever possible large populations were studied to ascertain the range of natural variation. A large number of herbarium specimens were also examined from the following herbaria, to whose curators I wish to extend my thanks for their help:

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Bolus Herbarium, University of Cape Town.

Compton Herbarium, National Botanic Gardens of South Africa, Kirstenbosch.

S.A. National Herbarium, Pretoria.

Delessert Herbarium, Conservatoire et Jardin Botaniques, Geneva.

Botanischer Garten und Institut für Systematische Botanik der Universität Zürich.

Botanical Museum and Herbarium, Copenhagen.

For cytological study cells were prepared for the observation of chromosomes in the following manner. Root tips were obtained from sprouting corms, and fixed in a chrome-acetic-formalin mixture known as Craf (Randolph 1935). After fixation the tips were dehydrated through a graded ethanol-n-butanol series (Randolph 1935) and embedded in wax. They were later sectioned at 12 microns and mounted on slides. The sections were stained in Feulgen reagent, prepared by the method of Kasten & Burton (1959) and finally mounted permanently in DPX. Although only 1 karyotype is illustrated for each species involved, several drawings were made by means of a camera lucida.

HISTORICAL NOTE

The genus *Sparaxis* was established by Ker-Gawler in 1805 as a segregate of the genus *Ixia*. This was at that time a very large and unnatural grouping which included species of *Ixia* itself, *Romulea*, *Tritonia*, *Babiana* and *Sparaxis* amongst others. Ker-Gawler (1805) recognised 9 species of *Sparaxis*, 8 of which were previously *Ixias* and one a *Gladiolus*. In 1812 he added another species, *Sparaxis pendula*, to bring the total to 10. The main character used to distinguish the new genus was the very dry, papery and often lacerate bracts and bracteoles, and the name *Sparaxis* is derived from the Greek *sparasein* meaning torn, which alludes to the bracts.

As conceived by Ker-Gawler, the genus was still a rather unnatural assemblage which included all the plants with these characteristic bracts, although the flowers and habit of some were rather different. Some had short perianth tubes and regular or almost regular flowers, others medianly zygomorphic flowers with a long and curved perianth tube while one had an unusually long and branched, pendulous inflorescence.

Those species which had the long curved perianth tube and zygomorphic flower were separated from *Sparaxis* by Sweet (1826) and placed in a new genus *Synnotia*. This genus is recognised today as a natural group closely related to *Sparaxis* but rather more advanced due to its specialised floral characters. *Synnotia* has been revised thoroughly by Lewis (1956) and now consists of 6 species, all quite distinct from *Sparaxis*.

Sparaxis pendula which differed from the other members of the genus in having a long, branched pendulous inflorescence was eventually removed from *Sparaxis* and became the type of the genus *Dierama* created by Koch (1854, 1861). Subsequently many more species of *Dierama* were described and it is now known to be a rather large genus of probably more than 25 species, which extends from the Eastern Cape Province into Central Africa and Kenya. It is also a fairly natural group but has in common with *Sparaxis* the peculiar dry, papery bracts. It may be an ancestral group as it has several primitive features such as persistent corms and an evergreen habit in contrast to *Sparaxis* which has a deciduous habit and short lived corms, which are renewed annually, as the old ones disintegrate.

Ecklon (1827) listed and described several species of *Sparaxis* including a number of new species. Most of these have proved to be synonyms or to belong to *Synmotia*. However some of his epithets remain, though they now apply to subspecies.

Klatt, who worked on the Iridaceae for many years during the latter half of the 19th century described several new species, listed others and began to clarify the situation by pointing out many cases of synonymy. Some of his new species have, however, also proved to be synonyms.

Several other authors described new species of *Sparaxis* most of which proved to belong to different genera or to be hybrids and colour forms of *S. tricolor*. When Baker revised the genus in the Flora Capensis (Vol. 6 p. 115) in 1896 he recognised only four species though by this time nearly 40 species had been described or mentioned and only 10 belonged to other genera. Since the study in Flora Capensis, little has been added to the literature except for the description of one new species and one variety by L. Bolus (1932a, 1932b).

HISTORICAL NOTE ON STREPTANTHERA

The genus *Streptanthera* was established by Sweet (1827) when he described *S. elegans*. In 1831 he described a second species *S. cuprea* which was no more than a colour form of the earlier species. The genus was established on the rather inadequate ground that the anthers were twisted round the style and that the stigma branches were rather large. It was this twisting of the anthers that prompted Sweet to give the genus this name which means twisted flower. The other characters like the dry membranous bracts and short perianth tube are the same as in *Sparaxis*. This similarity was not however, noticed until 1867 when Klatt drew attention to it.

Klatt realised the close relationship between these two genera and he placed them after one another in his description of the Iridaceae. He must have been rather confused over the genus *Streptanthera* as he first placed *S. tricolor* in

Sparaxis (Klatt 1868) and then later he placed it and 3 species of *Sparaxis* in *Streptanthera* (Klatt 1882).

Unfortunately no one followed up Klatt's work and Baker who worked on the Iridaceae during the late 19th century left *Sparaxis* and *Streptanthera* distinct and ignored Klatt's work. In the Flora Capensis, Baker distinguished *Streptanthera* from *Sparaxis* on the mistaken ground that the former was actinomorphic and had a short perianth tube, while the latter was zygomorphic, due to asymmetrically disposed stamens, and had a longer perianth tube. This was in spite of the fact that two of the four species of *Sparaxis* he described, namely *S. tricolor* and *S. fragrans* are perfectly actinomorphic. He also neglected to mention the very characteristic twisted anthers in *Streptanthera*.

Baker probably did not consider the two genera as being closely related as they are placed far apart with quite unrelated genera between them in all his works on the Iridaceae. Both Marloth (1915) and Phillips (1950) persisted in distinguishing these two genera on the basis of symmetry or asymmetry of the androecium.

THE INCORPORATION OF STREPTANTHERA IN SPARAXIS

As has been pointed out, *Streptanthera* has been incorrectly described since Baker wrote the Iridae in the Flora Capensis. There are in fact 3 species of *Sparaxis* which have symmetrically disposed stamens and in addition have perianth tubes which are not appreciably longer than *Streptanthera*.

Thus the differences between *Sparaxis* and *Streptanthera* remain the coiling of the anthers and the size of the stigma branches of *Streptanthera*. The stigma branches are, however, constructed in the same way as in the actinomorphic *Sparaxis* species, having bilobed and expanded tips, the margins of which come together to form the styler canal. Neither are the stamens unique, as *S. pillansii*, has anthers which are invariably twisted both in the bud and the open flower. This twist is however much less noticeable than in *Streptanthera*, but the difference here is only in degree. In all other characters especially corm tunics and bracts, which are often good generic characters in the Iridaceae, *Streptanthera* agrees very closely with *Sparaxis*. In my opinion *Streptanthera* is more closely related to *Sparaxis tricolor* and *S. pillansii* than these are to the remainder of the species of *Sparaxis* especially those with asymmetric stamens.

It is for these reasons that I propose incorporating the genus *Streptanthera* in *Sparaxis* and it is one of the purposes of this paper to clarify the confusion over the status of those plants previously known as *Streptanthera*. As I shall explain later I believe there exists only one species, not two as Sweet described, and this should now be known as *Sparaxis elegans*.

DIAGNOSTIC CHARACTERS

Corm

The corm is fairly small throughout the genus, and is uniformly globose. The corms are usually 1 to 3 cm in diameter, being largest in *S. pillansii*. The tunics are usually soft and consist of a fine fibrous network, except in *S. pillansii* where they are harder and coarser. Cormlets are produced in the lower axils, at the end of the flowering season in all species. There is usually only one fairly large but narrow cormlet, up to 1 cm long, in each axil and it is sheathed by the leaves. In *S. bulbifera* many more cormlets are produced, and these occur at all the nodes. These are very much smaller, being 0·1—0·2 cm long and quite prominent when mature. This is a very characteristic feature of *S. bulbifera*.

Stem

The stem is strictly speaking the peduncle or scape, i.e. the leafless, or almost leafless, stalk bearing the inflorescence. The term stem has, however, been used by most workers studying this family and will thus be used for convenience sake. It is always firm and thick compared to related genera like *Ixia* and *Dierama*. It is comparatively short when compared to the rest of the vegetation amongst which it grows, being on average 30 cm high. *S. pillansii* is the tallest species and often reaches 60 cm. The height, and the number of stalks produced, varies greatly with the seasonal conditions but usually 2 or 3 are produced per corm. The stalks are simple, or branched very close to the base except in *S. bulbifera* which usually has a branch and sometimes several, borne well above the basal leaves in the axil of a cauline leaf. This character also serves to distinguish this species.

The typical spicate inflorescence may bear few to several flowers. Again, the number varies greatly with conditions, being greater when rainfall is higher and the soil good. The flowers are laxly arranged and in comparison to related genera there are few per spike. *S. pillansii* has the largest number, though this seldom exceeds 10 per spike.

Leaves

They are usually pale green and soft, with a silvery sheen produced by rather large epidermal papillae. The leaves vary little from the usual sword shape with a width of about 1·5 cm, being slender and longer in *S. fragrans*, and broad, short and falcate in *S. grandiflora* subspecies *violacea*. The rather characteristic leaves serve little value in recognising species. There are 5 to 12 and these vary much in shape and size with conditions.

Bracts and Bracteoles

As already mentioned, these structures are characteristically dry and scarious and marked with brown flecks and stripes. In *S. tricolor*, *S. pillansii* and *S.*

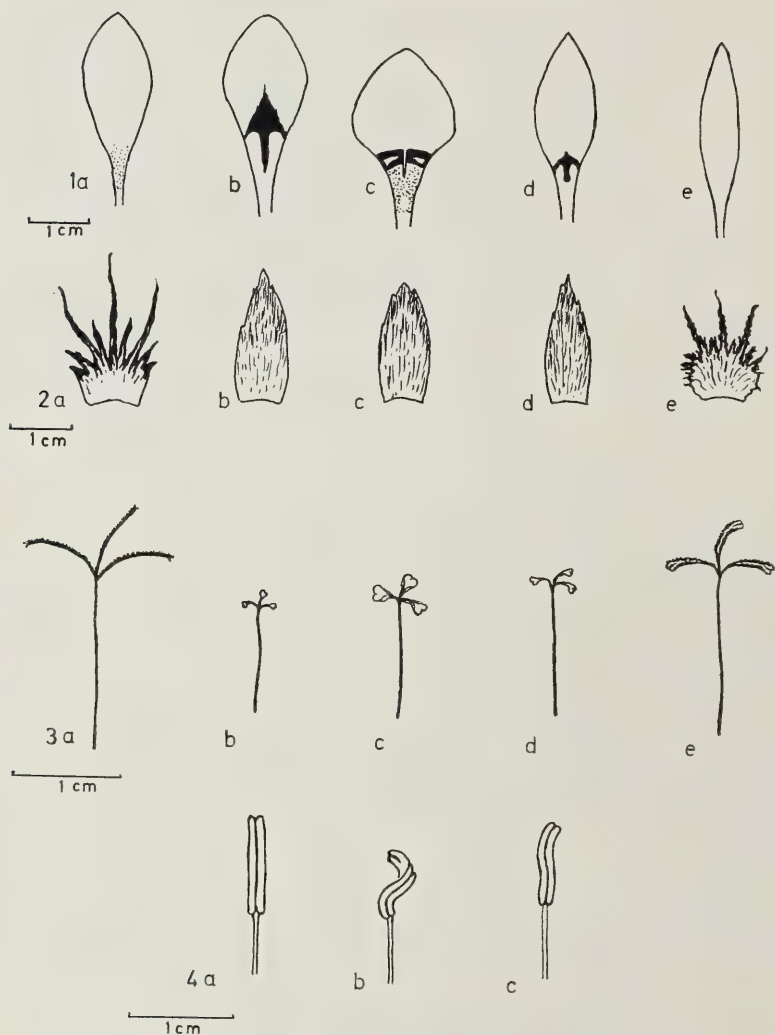


FIG. 1.

1a, 2a, 3a: perianth segment, bract and style respectively, of *Sparaxis bulbifera*. 1b, 2b, 3b, 4a: perianth segment, bract, style and stamen respectively, of *S. tricolor*. 1c, 2c, 3c, 4b: of *S. elegans*. 1d, 2d, 3d, 4c: of *S. pillansii*. 1e, 2e, 3e: perianth segment, bract and style respectively of *S. fragrans*.

elegans the bracts are largest, and entire or lightly lacerate. The bracteoles are also large, and marginally fused except at the tip. In the other species the bracts are smaller, being less than 2 cm long, and strongly lacerate with thin tapering cusps half the total length of the bract. The bracteoles are similar but fused only to the midline. The lacerations are very irregular and vary considerably within the same population. The lacerate bracts of *S. fragrans* are distinctive, as the long cusps are somewhat twisted and coiled, and their margins are usually irregularly serrated while in other species the cusp margins are smooth. (Fig. 1: 2a—e).

The Flower

Some of the species have rather dull-coloured flowers, but more often these are large and brightly coloured and marked in a striking way with geometrical patterns in contrasting colours. Frequently the nature of the patterning is very characteristic of a species. Colour and marking is usually constant in a species but occasionally colour differences occur or markings are absent. In *S. tricolor* and *S. elegans* unusually coloured or unmarked forms are known and these



PLATE 1.

Flower of *Sparaxis fragrans* showing the disposition of the stamens in an actinomorphic species.



PLATE 2.

Flower of *S. grandiflora* subsp. *acutiloba* showing the stigma and arrangement of stamens typical of the zygomorphic species.

can be regarded as mutants. In the various subspecies of *S. grandiflora* purple or white forms can predominate a population while other colours also occur and this should be regarded as a part of the variation pattern. (Fig. 1: 2.)

The perianth tube is always straight and fairly short. It is funnel shaped, consisting of a short narrow portion which is expanded upwards to form a cup. The segments are equal or sub-equal, and generally lanceolate in shape. In *S. elegans* the lobes are distinctly ovate, while in *S. grandiflora* subspecies *grandiflora* and subspecies *violacea* they are spatulate, a feature which is very characteristic. (Fig. 3: d, e.)

Androecium

The disposition of the stamens forms an important feature in the classification. The stamens are either symmetrically disposed with the anthers facing outwards or asymmetrically disposed and the anthers facing inwards. In the latter case the anterior stamen curves back to lie against the posterior perianth segment. (Pl. 2). The stamens of *S. elegans* are essentially symmetrical but due to the extreme coiling of the anthers around the style they appear asymmetrical.

The filaments are more or less as long as the anthers and the latter are unremarkable except in *S. elegans* where they are extremely coiled, and in *S. pillansii* where they are slightly so. (Fig. 1: 4.)

These features are obvious in the living plant but unfortunately almost impossible to see in dried material. Thus the clearest diagnostic feature is of questionable value in identifying dried specimens.

Gynoecium

The small, oval ovary is uniform in the genus. The style, however, varies considerably in length and shape. It extends to the middle of the anthers in *S. tricolor* and *S. pillansii*, to their apices in *S. elegans* and usually beyond the anthers in *S. bulbifera*. In the remaining species it is variable, usually reaching nearly to the apices of the anthers, but sometimes beyond. The style is straight and erect in the species with symmetrical stamens. In the species with an asymmetrical androecium it is curved backwards to lie against the posterior perianth lobe behind the stamens.

The style branches also vary considerably, and form a good character for recognising some species. In the actinomorphic species, excluding *S. fragrans*, the branches are short, being less than 4 mm, with the ends expanded to form a bilobed lip behind which the margins curve upward and fold together to form a styler canal. The expanded tips of the style branches are largest in *S. elegans* and smallest in *S. tricolor*. In *S. fragrans* the branches are longer and expanded for half their length. The branches are bivalved and the upper surface is papillose. In the zygomorphic species the branches are longest being 0.8 to 1 cm long, filiform with a cleft tip and a papillose upper surface. (Fig. 1: c).

The fruits of all species are similar, being globose, three valved capsules with firm membranous walls. The seeds are comparatively large, being about 0.5 mm in diameter, smooth, round and often shiny.

CYTOLOGICAL OBSERVATIONS

Since *Dierama*, *Ixia* and *Synnotia* have been considered closely related to *Sparaxis*, species of these genera were investigated in addition to *Sparaxis*. In all, 5 species in four genera were studied. The species and diploid number are listed below: (Fig. 2: A—E).

<i>Dierama pendulum</i>	2n = 20
<i>Ixia viridiflora</i>	2n = 20
<i>Synnotia variegata</i>	2n = 20
<i>Sparaxis elegans</i>	2n = 20
<i>S. grandiflora</i>	
subsp. <i>acutiloba</i>	2n = 20

The illustration of the chromosomes of these species shows that all share a

rather similar karyotype. The diploid number is 20, the karyotype is rather asymmetric (Stebbins 1950) and consists of fairly small chromosomes. There are two pairs of rather longer chromosomes, and the primary constrictions are sub-median or median. Owing to the small size, details are not as clear as one would wish, and the satellites are seldom clearly seen. A pair of satellite chromosomes, however seems to be present in all species.

As can be seen *Sparaxis* and *Synnotia* have rather smaller chromosomes than *Dierama* and *Ixia* but the pattern is otherwise similar.

KEY TO THE SPECIES

Two keys are provided. The first is a simple natural one which will be of greatest use when dealing with the living plant. The other is more complex and is designed for dried material or in a few cases for living plants which are not flowering.

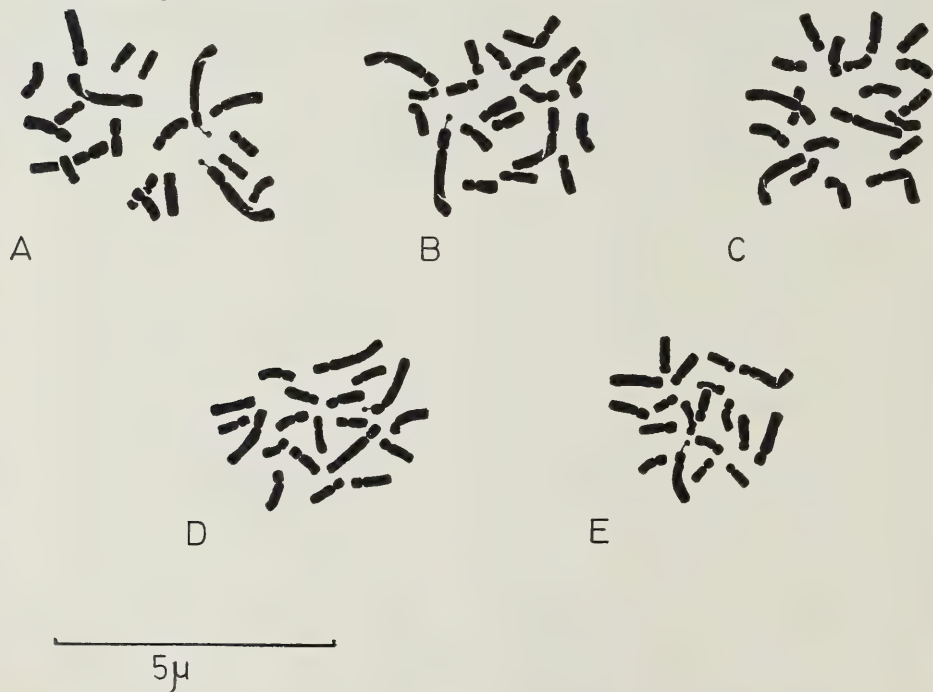


FIG. 2.

Karyotypes of A. *Dierama pendula*; B. *Ixia viridiflora*; C. *Synnotia variegata*; D. *Sparaxis elegans*; E. *S. grandiflora* subsp. *acutiloba*.

KEY 1

1. Stamens symmetrically disposed around the erect style: (This includes the case where anthers are coiled)
 2. Bracts entire or slightly lacerate
 3. Anthers erect; extending far beyond the style branches.
 4. Anthers straight; yellow..... 1 *tricolor*
 - 4'. Anthers incurved, slightly twisted; purple..... 2 *pillansii*
 - 3'. Anthers coiled; extending only to the apex of the style..... 3 *elegans*
 - 2'. Bracts deeply lacerate with cusps half as long as the bract..... 4 *fragrans*
- 1'. Stamens asymmetrically disposed, the style arched to lie behind the stamens.
 5. Stem usually branched and bearing a cauline leaf; many small Cormlets produced after flowering at all nodes;..... 5 *bulbifera*
 - 5'. Stem always simple and not bearing a cauline leaf; cormlets not produced in numbers and never exposed..... 6 *grandiflora*

KEY 2

1. Bracts entire or slightly lacerate, more than 1 cm long.
 2. Anthers spirally coiled; perianth segments broadly ovate and obtuse..... 3 *elegans*
 - 2'. Anthers linear or slightly twisted and curved; perianth segments lanceolate or sub-ovate, acute or obtuse
 3. Plants up to 65 cm tall; up to 10 flowered; anthers red to brown; perianth segments lanceolate and acute..... 2 *pillansii*
 - 3'. Plants up to 40 cm tall; up to 5 flowered, anthers yellow to ochre; perianth segments sub-ovate and obtuse..... 1 *tricolor*
- 1'. Bracts strongly lacerate, with cusps usually as long or longer than the rest of the bract, undivided portion less than 1 cm long.
 4. Margins of cusps irregularly serrated; perianth segments less than 2.5 cm long, and less than 0.8 cm broad..... 4 *fragrans*
 - 4'. Margins of cusps entire, perianth segments usually more than 2.5 cm long, and more than 0.7 cm broad.
 5. Stem often branched and bearing a cauline leaf; many cormlets produced at all nodes on the mature plant; flowers cream or white, sometimes externally marked lightly with purple streaks and sometimes lightly spotted at the base of the perianth segments; flowers very rarely plum coloured; segments lanceolate and acute..... 5 *bulbifera*
 - 5'. Stem always simple and cauline leaf absent; few cormlets produced and at lowest nodes only; flowers variously coloured, if cream or white then strongly marked at base of segments; segments lanceolate to ovate and spatulate, and acute to obtuse.
 6. Flowers yellow or purple, perianth segments lanceolate and acute or sub-obtuse..... 6 *grandiflora*
subsp. *acutiloba*
 - 6'. Flowers white or if purple, segments spatulate; segments lanceolate to spatulate and obtuse.
 7. Perianth segments lanceolate—ovate; cream to yellow, marked with black spots at the base..... 6b *grandiflora*
subsp. *fimbriata*
 - 7'. Segments spatulate: white, purple or red purple.
 8. Leaves linear, sometimes slightly curved, acuminate, usually long; flowers usually uniformly deep purple; occurring in the Tulbagh area..... 6a *grandiflora*
subsp. *grandiflora*
 - 8'. Leaves narrowly oblong to oblong, falcate with obtuse-acuminate tips; flowers not uniformly deep purple; occurring in the Caledon area..... 6c *grandiflora*
subsp. *violacea*

TAXONOMIC TREATMENT

SPARAXIS

Ker. in Kon. & Sims Ann. Bot. 1: 225 (1805) et Gen. Irid. 94 (1827); Ecklon, Top. Verz.: 27 (1827); Klatt in Linnaea 32: 747 (1863) et Erganz.: 56 (1882); Baker in Journ. Linn. Soc. Bot. 16: 99 (1878); Benth. & Hook., Gen. Pl. 3: 708 (1883); Pax in Engl. & Prantl. Pflanzenf. 11, 5: 155 (1889); Baker, Handbk. Irid.: 198 (1892) et Fl. Cap. 6: 115 (1896); Marloth, Fl. S.A. 4: 148 (1915); Diels in Engl. & Prantl. Pflanzenf. ed. ii. 15a: 491 (1930); Lewis in Adamson & Salter, Fl. Cap. Pen.: 245 (1950); Phillips, Gen. S.A. Pl. ed. ii: 281 (1951).

STREPTANTHERA Sweet in Br. Fl. Gard. ser. i. t. 127 (1827) Klatt, Erganz.: 56 (1882); Benth. & Hook., Gen. Pl. 3: 703 (1883); Pax in Engl. & Prantl. Pflanzenf., 2, 5: 154 (1889); Baker, Fl. Cap. 6: 86 (1896); Phillips, Gen. S.A. Pl. ed. ii: 218 (1951).

BELEMCANDA Moench, Meth. Suppl.: 214 (1802).

IXIA L. Amoen. Acad. 4: 300 (1756) pro parte sole *I. bulbifera*.

Corm small, globose with tunics of fine to moderately fine fibres. *Stem* firm, semi-erect or erect, glabrous, simple or branched or bearing a cauline leaf, with a few large cormlets in the lower axils or many small cormlets in all axils. *Leaves* acute, acuminate or obtuse-acuminate, glabrous and closely ribbed with the midrib distinct. *Spike* few to several flowered, occasionally solitary, lax, flowers arranged distichously in bud, alternate or secund when blooming. *Bract* larger dry scarious and fringed and streaked with brown markings, deeply lacerate with long tapering cusps or entire or lightly lacerated; *bracteoles* similar, smaller, fused to the middle or almost to the top. *Flowers* large, actinomorphic or zygomorphic; *perianth tube* short, cylindrical at base, expanded upwards; *perianth* segments equal or sub-equal, lanceolate to ovate or spatulate, acute to obtuse. *Stamens* arising from the base of the expanded part (throat) of the perianth tube, symmetrically or asymmetrically disposed; *filaments* filiform, straight or curved, contiguous or free, about as long as the anthers; *anthers* straight, curved or spirally coiled, basifixed just above the base, facing outwards or inwards, loculi opening from base to apex. *Ovary*, ovoid; *style* extending to the middle, top or beyond the anthers, straight and erect or curved; *branches* 3, short with expanded tips or long and filiform with the upper surface papillose. *Capsules* small, globose and firm—membranous; *seeds* several, large smooth, rounded and often shiny.

Type species. *S. bulbifera* (L) Ker.

1. *S. tricolor* (Schneevogt) Ker. in Kon. & Sims Ann. Bot. 1: 225 (1805) et Gen. Irid.: 93 (1827); Ait., Hort. Kew ed. ii. 1: 85 (1810); Klatt in Linnaea 32: 747

(1863); Baker in J. Linn. Soc. Bot. 16: 98 (1878), Handbk. Irid.: 197 (1892), et Fl. Cap. 6: 117 (1896); Marloth, Fl. S.A. 4: 148 (1915). *Ixia tricolor* Schneevogt, Icon. Pl. Rar.: t. 39 (1795); Ker. in Bot. Mag. t. 381 (1797); Vahl, Enum. Pl. 2: 74 (1804); D.C. in Red., Lil.: t. 129 (1807). *Streptanthera tricolor* (Sweet) Klatt, Erganz. 56 (1882).—Iconotype: Schneev. 1c. Pl. Rar. t. 39.

Corm globose, 1—2 cm in diameter with tunics of fairly fine silky, white fibres. *Stem*, simple, erect or semi-erect, firm usually 30 cm (10 to 40 cm) high, 1—5 in number, bearing a few small cormlets at the lower nodes. *Leaves*, 5—10 distichous, arranged as a fan, generally 1—2 cm broad, ensiform, acute, acuminate, usually long but never reaching beyond the lowest flowers, glabrous, closely veined with a prominent midrib. *Spike* lax, 2—5 flowered. *Bract*, dry, scarious marked with brown flecks, lightly lacerate at the tip or entire, 2·5—3·0 cm long; actinomorphic; *bracteoles* similar but shorter, 2·0—2·5 cm, bifid. *Flowers* actinomorphic, brightly coloured and patterned; *Perianth tube* about ·8 cm long, narrow portion ·2—·3 cm long, yellow; *perianth segments* subequal, broadly lanceolate, acute, 2·5—3·3 cm long and about 1 cm broad, vermilion or salmon, marked with a black to red sagittate marking at the base (rarely unmarked); *Stamens* symmetrically disposed; filaments 6—7 mm long, yellow, linear, contiguous, inserted at the base of the broad part of the perianth tube; *anthers* 8—9 mm long, linear, white or yellow, basifixed just above the base, cells facing outwards. *Ovary* small, ovoid, *style* yellow, comparatively short, not reaching to the middle of the anthers; *branches* 0·1—0·2 cm long and slightly expanded and bilobed at the tips. *Capsules* globose, firmly membranous; *seeds* several, large, smooth and round. *Chromosome number* $2n = 20$.

Clay flats and damp places north west of Nieuwoudtville usually occurring in renosterbosveld (Acocks 1952).

Flowering time: September.

Incones: Schneev. 1c. Pl. Rar. t. 39 (1795) as *Ixia tricolor*; Ker in Bot. Mag. t. 381 (1797) as *I. tricolor* and t. 1482 as *S. tricolor*; Redoute, Lil. t. 129 (1807) as *I. tricolor*; Marloth, Fl. S. Afr. 4, fig. 40.

CAPE.—3119 (Calvinia): 10 miles from Nieuwoudtville on Grasberg road. (—AC), *Barker 9541* (NBG); Grasberg, *Barker 9551* (NBG); Grasberg road north west of Nieuwoudtville, *Goldblatt 348* (BOL); vlei near Nieuwoudtville, *Leipoldt 280* (BOL).

WITHOUT LOCALITY: *Ecklon & Zeyher 111* (SAM).

LOCALITY DOUBTFUL: Tulbagh, *Ecklon s.n.* (PRE 30490); Tulbagh, *Pappe s.n.* (SAM 21314).

This attractive species is endemic to a very small area. It is found in a shallow valley, north west of Nieuwoudtville at a distance of 4 miles from the town, extending a further 7 miles. In apparently undisturbed ground the plants occur amongst rhenosterbos and are thus lightly shaded. The soil type is invariably a heavy clay which is waterlogged for part of the growing season, though it eventually dries to an almost cement-like consistency.

With regard to flower colour, two shades of orange occur in nature, a vermilion and a paler creamy-orange shade. The markings are very much the same in most plants but rarely, plain orange unmarked forms can be found.

The species has an uncomplicated taxonomy and has apparently never been described under another epithet since it was named by Schneevogt. However a large number of hybrids and colour forms have been ascribed to this species. As is well known, species of *Sparaxis* are all interfertile and hybrids are easily produced (Horn 1962; L. Bolus 1932). In view of this it is perhaps fortunate that no more hybrids have been described. These putative hybrids including *S. blanda* Sweet, *S. griffini* Sweet, *S. versicolor* Sweet and *S. stellata* Roem. & Schultes. are discussed in a later section.

The flowers of *S. tricolor* have such characteristic markings that the species should never be misidentified. It has been placed at the beginning of the present treatment as it is clearly the least specialised with its symmetrically disposed stamens, straight anthers, erect style and short perianth tube.

2. ***S. pillansii*** L. Bolus in S.A. Gard. 22: 57 (1932).—Holotype: *L. Bolus s.n.* in the Bolus Herbarium (BOL 19182).

Corm globose, from 1—3 cm in diameter, tunics of moderately fine, brown rather hard fibres. *Stem* firm, glabrous, erect, simple, 25—65 cm high, 2—4 in number, bearing small cormlets in the lower axils. *Leaves* 8—10, distichous narrow, ensiform; up to 35 cm long, not reaching the lowest flowers, only lightly ribbed. *Spike* 4—9 flowered, lax. *Bract* large, 2.5—2.9 cm long, dry, scarious with red-brown streaks, lightly lacerate at the apex; *bracteoles* similar, fused almost to the tip, smaller. *Flowers* brightly coloured and marked, actinomorphic; *perianth tube* yellow, 0.7—0.9 cm long, the narrow portion 0.2—0.3 cm long; *perianth segments* old rose, marked at the base with a heart shaped yellow portion extending into the perianth tube and separated by a narrow purple band from the rose coloured part, subequal, lanceolate and broadly sub-acute, 2.2—2.9 cm long, 1.0—1.3 cm wide. *Stamens* symmetrically disposed; *filaments* white, linear, contiguous at the base, 0.7—0.8 cm long, inserted in the throat of the perianth tube; *anthers* purple red, slightly longer than filaments, basifixed, incurved and slightly twisted at the tip, cells facing outwards. *Ovary* small, ovoid; *style* white with red above, erect reaching to the

middle of the anthers; *branches* red maroon, 0·3 cm long expanded at the tip, bilobed, extending between the anthers. *Capsule* globose, firmly membranous; *seeds* several, fairly small, round and smooth. *Chromosome number* unknown.

Rocky hills north of Nieuwoudtville, among boulders in heavy red clay which remains waterlogged for much of the growing period. Also recorded from the farm Driefontein, south west of Calvinia.

Flowering time: September.

CAPE.—3119 (Calvinia): Klipkoppies Nieuwoudtville (—AC), *Barker* 9530 (NBG), *Lewis* 5856 (NBG); near Nieuwoudtville *L. Bolus* s.n. (BOL 19182); Charles Hoek north east of Nieuwoudtville, *Goldblatt* 327 (BOL); Rooikoppies east of Nieuwoudtville, *Marloth* 7937, 7949 (PRE); Near Nieuwoudtville, *Metelerkamp* s.n. (BOL 19182); Driefontein south west of Calvinia (—CA), *Marloth* 10428 (PRE).

This is the tallest of all the species of *Sparaxis*. It is not so brightly coloured as *S. tricolor* nor so strikingly marked as *S. elegans* but its red colour and markings are quite distinctive. It hybridises easily with *S. tricolor* and is one of the parents of several garden forms now grown.

To the author's knowledge, this species remained unknown until 1915 when it was collected by Marloth. Later it was cultivated by specialists who at first thought it a garden hybrid. In 1930 it was rediscovered in the wild and was described by L. Bolus in 1932.

The plant has a rather peculiar, very localised habitat about which more should be said. It occurs over a few acres on the rocky hills a mile north east of Nieuwoudtville, where it is plentiful. It grows in red clay around large boulders where water accumulates in quantity during the short wet season and is semi-aquatic during the early stages of growth. It has also been recorded by Marloth from the farm Driefontein, south west of Calvinia, but this requires confirmation.

S. pillansii is closely related to *S. tricolor* in having very similar, though somewhat smaller markings, symmetrical and erect stamens and a very similar style, but it is quite easily distinguished because of its height, colour and the slight twist of the anthers.

3. *S. elegans* (Sweet) Goldblatt. comb. nov.

Streptanthera elegans Sweet, Br. Fl. Gard. ser. 1: t. 209 (1827) et Hort. Brit. ed 11: 501 (1830). Basionym; Lodd., Bot. Cab.: t. 1359 (1827); Klatt, *Erganz.*: 56 (1882); Baker in J. Linn. Soc. Bot. 16: 92 (1878), *Handbk. Irid.*: 160 (1892) et Fl.: Cap.: 86 (1896).—Iconotype: Brit. Fl. Gard.: t. 209. *S. cuprea* Sweet, Br. Fl. Gard. ser. 2: t. 122 (1831) et Hort. Brit. ed. ii: 501 (1830); Paxt., *Mag. Bot.* 1: 893 (1878), *Handbk. Irid.*: 160 (1892) et Fl. Cap. 6: 86 (1896); Pole-Evans

in Fl. Pl. S. Africa 8: pl. 320 (1928). *Sparaxis cuprea* (Sweet) Klatt in Linnaea 35: 378 (1868).—Iconotype: Br. Fl. Gard. ser. ii: t. 122 *Streptanthera cuprea* var *non-picta* L. Bolus. S.A. Gard. 32: 276 (1932).—Holotype: Buhr s.n. (BOL 19443).

Corm globose, 1.0 to 1.7 cm in diam, with tunics of moderately fine, white fibres. *Stem* semi-erect short, 10–30 cm long, simple, firm, 2–5 in number, bearing a few small elongated cormlets at the lowest nodes. *Leaves* 5–9, distichous, arranged as a fan shape, ensiform, acuminate, glabrous, closely veined, midrib prominent, lower leaves sometimes curved, 0.5 to 1.4 cm broad, 8–25 cm long. *Spike* 1–5 flowered. *Bract* 2.2 cm long; *bracteoles* similar but smaller, 1.6–2.0 cm long, apex bifid. *Flowers*, actinomorphic, brightly coloured and patterned; *perianth tube* yellow 0.6–0.8 cm, narrow portion short, 0.15 to 0.2 cm *perianth segments* sub-equal, ovate and obtuse, 1.8–2.2 cm long and 1.4–1.7 cm broad, vermilion fading to pink, rarely white, base marked internally with a violet band, with or without 2 yellow streaks at the edges of the band, rarely unpatterned. *Stamens* symmetrically disposed; *filaments* yellow; 0.5–0.6 cm long, inserted at the base of the narrow part of the perianth tube, *anthers* maroon to brown, shorter than filaments, .04–0.4 cm high, not linear but coiled in a spiral round the style. *Ovary* small, ovoid; *style* yellow but red at the top, reaching to the top of the anthers, *branches* short, about 2 mm long, the tips forming a bilobed and expanded lip, behind which the margins curve upwards and meet to form a stylar canal. *Capsules* globose; *seeds* comparatively large, round and smooth. *Chromosome number* $2n = 20$.

Clay hills and flats around Nieuwoudtville.

Flowering time: September.

Icones: Sweet in Br. Fl. Gard. ser. i: t. 209 (1827) as *Streptanthera elegans* and Br. Fl. Gard. ser. ii: t. 122 (1831) as *S. cuprea*; Lodd., Bot. Cab. t. 1359 (1827) as *S. cuprea*; Letty in Fl. P.S. Afr. pl. 320 (1928) as *S. cuprea*.

CAPE—3119 (Calvinia) Glenlyon farm (—AC), *Acocks* 19025 (PRE), *Goldblatt* 350 (BOL), *Lewis* 5909 (NBG), Klipkoppies slopes, *Barker* 9536 (NBG); Nieuwoudtville, *L. Bolus* s.n. (BOL 19588), *Buhr* s.n. (NBG 60957) and (BOL 19443), *Loubser* 946 (NBG), south of Nieuwoudtville, *Goldblatt* 102 (J); Willemsrivier 1.5 miles north Nieuwoudtville, *Goldblatt* 349 (BOL); Willemsrivier, *Leipoldt* 218 (SAM); Oorlogskloofrivier, *Leipoldt* 799 (BOL, SAM); east of Nieuwoudtville, *Marloth* 9647 (PRE).

This species is quite unmistakable as it is so strikingly marked with salmon-pink and contrasting brilliant violet and has dark purple, coiled anthers. In

populations south of Nieuwoudtville the violet band has two bright yellow spots in it, which give the effect of a remarkable geometric pattern. The species is not as localised as *S. tricolor* and *S. pillansii* and its range extends from 2 miles north of Nieuwoudtville and almost 10 miles southwards. It is extremely common in this area on clay and decomposing shale.

This species was previously known as *Streptanthera*, a genus comprising of two separate species and a variety. The species differed only in their colouring, *S. elegans* Sweet having white perianth segments and *S. cuprea* Sweet having salmon segments, while the variety had unmarked salmon coloured flowers. As previously mentioned, mutant forms do occur rarely, and both the white form and the unmarked one are examples of these. The author has seen many thousands of individuals of *Sparaxis elegans* and *S. tricolor* and observed only one mutant, an unmarked *S. tricolor*. It is perhaps unfortunate that *Sparaxis elegans* must be based on the description of the unusual white flowered form, but this epithet has priority over that of *Streptanthera cuprea*, the common form.

4. *S. fragrans* (Jacq.) Ker. in Kon. & Sims. Ann. Bot. 1: 225 (1805). et Gen. Irid.: 93 (1827); Baker, Fl. Cap. 6: 117 (1895); Klatt, Erganz.: 55 (1882). *Ixia fragrans* Jacq., Ic. Pl.: t. 274 (1793); Willd., L. Sp. Pl. 1: 197 (1798); Pers. Syn. Pl. 1: 47 (1805).—Iconotype: Jacq. Ic. Pl. t. 274; *I. sordida* Hornem., Hort. Hafn. Suppl. 6 (1819).—Holotype: Horneman s.n., (C) *Gladiolus odoratus* Schrank, Denks. Bot. Ges. Regensb. 2: 206 (1822) non Salisb. (1796). nom illegit.—Iconotype: Jacq. Ic. Pl.: t. 274.

Corm globose, 0.8—1.5 cm in diameter, tunics of fine fibres extending upwards in a neck. *Stem* firm, glabrous, erect, simple, 7—30 cm long, 1 or 2 in number and bearing a few cormlets in the lowest axils. *Leaves* 6—10, distichous, linear-ensiform and acute, usually narrow but from 0.2—0.9 cm broad, and from 5—20 long, the lower being shorter and recurved. *Spike* lax, 1—2 flowered but occasionally up to 5 flowers. *Bract* dry, firm, scarious marked with brown streaks, deeply lacerate, apices forming long cusps, usually 3 in number, twisted, coiled, and irregularly serrated; *bracteoles* similar and smaller with 2 cusps. *Flowers* actinomorphic, bright or dull coloured, seldom marked and having a rather unpleasant odour; *perianth tube* yellow, 0.6—0.8 cm long, the narrow portion up to 0.4 cm long; *perianth* segments yellow, cream or beige, occasionally marked at the base with two small dark spots, sometimes marked externally with purple or brown streaks down the centre, subequal, lanceolate, acute, occasionally retuse, 1.8—2.5 cm long, about 0.7 cm wide; *Stamens* symmetrically disposed; *filaments* yellow, about 6—9 mm, long, linear, facing outwards. *Ovary* small, ovoid; *style* yellow linear, erect reaching nearly to the top of the anthers; *branches* about 0.5 cm long, curved, expanded for

half the length, lying between the anthers. *Capsule* small, globose and firm-membranous; *seeds* small, round and smooth. *Chromosome number* unknown.

Damp clay flats and banks in the Caledon and Bot river areas.

Flowering time: August to September.

Icones: Jacquin, 1c. Pl.: t. 274 (1793) as *Ixia fragrans*.

CAPE—3419 (Caledon): near Bot River (—AA), *Barnard s.n.* (BOL 29566); 1 mile north of Bot River, *Goldblatt 290* (BOL); 10 miles north of Bot River, *Goldblatt 296* (BOL); 1 mile along Langhoogte road, *Goldblatt 299* (BOL); between Bot River and Goedvertrou, *Rourke 1091* (NBG); 1 mile on Caledon road past Villiersdorp turnoff (—AB), *Barker 4* (BOL); Caledon-Villiersdorp road, *Barker 5* (BOL); Caledon-Villiersdorp road, *Barnard s.n.* (BOL 29564); Zwart Berg, Caledon, *Ecklon and Zeyher 118* (SAM, PRE, Z); 4 miles east Caledon near Main road, *Goldblatt 342* (BOL); Diep Rivier, *Martley s.n.* (BOL 29565).

This rather small-flowered species, which often has very slender leaves, was described and figured by Jacquin at the end of the 18th century. Though it was subsequently mentioned by other authors and duly placed in *Sparaxis* by Ker-Gawler it remained rather poorly known, and its existence was doubted by Baker (1896). It was collected during the 19th century by Ecklon and Zeyher, and Horneman described the plant as *S. sordida*.

The species was collected at infrequent intervals during the last 30 years but not recognised as *S. fragrans* except by T. Barnard. Recent investigation has shown that it is very common on clay slopes and flats in the Bot River Valley and along the Caledon Road. It is quite distinct from *S. bulbifera* and *S. grandiflora*, though the bracts are similar. Its small flower, unmistakable odour and symmetrically disposed stamens distinguish it sharply from these last mentioned species.

S. fragrans is intermediate between the actinomorphic and zygomorphic flowered species. Its bracts and bracteoles are very like the lacerate type of *S. bulbifera* and *S. grandiflora* though they differ in having serrate margins. The style is intermediate in length as it extends to the apex of the anthers, and has long branches, although the ends are expanded as in the actinomorphic species. The symmetrical stamens point to a close relationship with *S. tricolor*.

5. *S. bulbifera* (L.) Ker. in Kon. & Sims. Ann. Bot. 1: 225 (1805) et Gen. Irid.: 94 (1827); Aiton, Hort. Kew. ed ii. 1: 86 (1807) pro parte excl. plantae florum luteorum; Klatt in Linnaea 32: 748 (1867) pro parte excl. plantae florum

luteorum; Baker in Linn. Soc. Bot. 16: 98 (1878) pro parte excl. var *flava* Thunb. ined.; Baker, Handbk. Irid.: 197 (1892) pro parte excl. var *violacea* Ecklon et plantae florum luteorum. *Belamcanda bulbifera* (L.) Moench, Method. Suppl.: 214 (1802). *Ixia bulbifera* L. Amoen. Acad.: 300 (1756); Miller, Dict. ed. 8: *Ixia* 6 (1768) et Icon.: pl. 236, f.2 (1760); Lam., Encyc. 3: 339 (1789); Burmann, Prod. Fl. Cap.: 1 (1768) Thunb., Dissert. de *Ixia*: 474 (1799) pro parte excl. vars. *flava*, *purpurea*, *rubra-albaque*; Willd., in Linn. Sp. Pl. 1: 204 (1798); D.C. in Red., Lil.: t. 128 (1827).—Neotype: *Linnaeus* 58/16 in Linn. Herb. *I. anemonaeflora* D.C. in Red., Lil.: t. 85 ($\pm$ 1804) non Jacq. (1793).—Iconotype: Red. Lil.: t. 85 *Sparaxis albiflora* Ecklon, Top. Verz.: 28 (1827)—Lectotype: *Zeyher* s.n. (SAM).

Corm small, globose, 0.9—1.6 cm in diameter, tunics of fine white fibres. *Stem* firm, glabrous, erect, usually branched once, but occasionally up to 3 times, 15—50 cm tall, bearing many small cormlets in the axils of all the leaves including the cauline leaves subtending the branches, cormlets appearing only after flowering. *Leaves* 5—9, distichous, ensiform, acute or acuminate, 0.4—1.0 cm broad, rarely reaching as high as the lowest flowers, densely ribbed with the midrib distinct. *Spike* lax, 1—4-flowered or occasionally up to 6-flowered. *Bract* dry, firm, scarious, marked with brown streaks near the margin, deeply lacerate, apices forming 1—3 long cusps which are straight or slightly twisted and entire; *bracteoles* similar, smaller and usually 2-cusped. *Flowers* zygomorphic, and cream coloured; *perianth tube* yellow but lower portion green externally, 1.4—1.6 cm long, the narrow portion 0.5—0.7 cm; *perianth segments* cream to white internally, rarely black-dotted at the base, the outside similar or frequently broadly streaked down the centre with purple, (segments rarely uniformly plum coloured), lanceolate, subacute, 2.5—2.8 cm. long, about 1.2 cm broad. *Stamens* asymmetrically disposed, the anterior stamen recurved to lie against the posterior perianth segment; *filaments* white, curved, 0.7—0.8 cm long; *anthers* white, facing inwards and slightly curved, basifixed, 0.7—0.8 cm long. *Ovary* small, ovoid; *style* white, usually reaching beyond the top of the anthers, curved and lying behind the stamens against the posterior perianth segment; *branches* white, filiform and curved, about 1 cm long. *Capsule* small, globose, firmly membranous; *seeds* fairly numerous, round. *Chromosome number* unknown.

Flats or lower slopes of hills and mountains. Most frequently in sandy ground which is very wet during winter. Also on clay or hill slopes.

Flowering time: August to October.

Icones: Miller. Ic. Pl. t. 236 fig. 2 (1760) as *Ixia* sp.

CAPE—3318 (Cape Town): between Bokbaai and Darling (—AC), *Esterhuysen* 4375 (BOL); Darling sandy places, *Grant* 2538 (BOL); Malmesbury (—BD), *Compton* 9374 (NBG); Paardeberg Paarl (—CA); *Salter* 7665 (BOL); Kalbaskraal, *Weiderman and Oberdieck* 300 (PRE); Wellington (—CB), *Thomson s.n.* (PRE 30489). Muldersvlei (—CC), *Lewis* 4431 (SAM); Ysterplaat airport, west boundary (—CD), *Goldblatt* 262 (BOL); Tygerberg, *Henry s.n.* (NBG 63052); Kraaifontein, *Hubbard* 243 (BOL); Welgemoed, Bellville, *Loubser* 2111 (BOL); Mamre, *Cassidy* 252 (NBG); Mamre hills, *Compton* 11607 (NBG) *Wasserfal* 1010 (PRE); Ganzekraal vlei, *Goldblatt* 305 (BOL); Kenilworth (—DC), *H. Bolus* 8021 (BOL, PRE); Milnerton, *Cassidy* 254 (NBG); Llandudno, *Compton* 1482 (NBG); Mowbray, *Marloth* 7169 (PRE); Cape Town, *Pappe s.n.* (SAM 48515); Green point, *Pappe s.n.* (SAM 21316), Zeyher s.n. (PRE 30484, Z); Cape Flats, *Schlechter* 1558 (Z).

—3319 (Worcester): Worcester (—DB), *Walters* 194 (NBG).

—3418 (Simonstown): Oatlands point (—AB), *Wolley-Dod* 2855 (PRE); Sandy flats near Gordons Bay (—BB), *Parker* 4239 (NBG).

—3419 (Caledon): 9 miles west Bot river (—AA), *Goldblatt* 330 (BOL); west of Caledon, *Goldblatt* 331 (BOL); Mossel river shore, Hermanus (—AC), *Compton* 2362 (NBG); Klein river mountains, *Stokoe s.n.* (SAM 65861); Stanford, Klein river mountains, *Stokoe* 6167 (BOL); Hermanus near Hawston (—AD), *Goldblatt* 329 (BOL); Hermanus camp, *Lussem* 10 (NBG); Ratel river near homestead (—CA), *Goldblatt* 335 (BOL); Dirk Uyskraal farmhouse, *Goldblatt* 331 (BOL); west of Elim, *Muir* 5020 (NBG).

—3420 (Bredasdorp): Bredasdorp (—DA), v. *Breda* 713 (PRE).

There is some doubt that specimen 58/16 in the Linnaean Herbarium is the type of *Sparaxis bulbifera*.

In the description (Centuria 2, 1756) Miller is mentioned as having provided the specimen or corms, which are believed to have reached Linnaeus in 1755. The specimen in the Linnaean Herbarium is not credited to Miller, but has the inscription "H.U." indicating that the plant was grown at Uppsala. As it was Linnaeus' habit to endorse specimens on the back with the name of the sender, it seems Linn. Herb. 58/16 was probably not provided by Miller. This specimen was probably made after 1756 and identified by Linnaeus as *Ixia bulbifera*. It matches the description of *I. bulbifera* though not perfectly. For example, the corm is described but the specimen does not have one. In addition, it is mentioned that there are two to three flowers per stem while specimen 58/16 has only two. Thus Linnaeus must have seen several specimens. There can, however, be no doubt of the identity of the species as it is the only *Sparaxis* in which the production of cormlets is distinctive and the colour description: *flavescenti-albida fundo flavo*, (i.e. cream with a yellow base) is unique to *S. bulbifera*. Therefore

it is proposed that the specimen in the Linnaean Herbarium is considered as a neotype.

Although this species is quite distinct, it is often difficult to recognise until it has almost finished flowering. This is because the branches are often concealed at the early stages, and the cormlets do not form until after flowering. The species can be distinguished from the other white-flowered forms on less obvious points; it differs from *S. grandiflora* subspecies *fimbriata* in having subacute perianth segments and none or only small dark spots at the base of the segments; from subsp. *violacea* (white form) as the latter has spatulate perianth segments.

This is the most widespread of the species of *Sparaxis*. It is found from Picketberg in the north, through the Malmesbury and Cape Town districts and east to Caledon and Bredasdorp, with a single record from the Worcester area. It has the widest ecological tolerance, as it occurs on sand as frequently as on clay, and grows in vleis or somewhat drier areas, on flats and lower slopes of mountains.

Although *S. bulbifera* has a fairly uncomplicated taxonomy, it has been confused with *S. grandiflora* since the former was described. Thunberg in his Dissert. de *Ixia* included in the species, white, yellow and purple flowered forms which we know now to be distinct species. *S. grandiflora* subsp. *fimbriata* has frequently been included in *S. bulbifera* or vice versa and even Lewis (1950) failed to realise these were two different species.

It has also long been confused with *S. grandiflora* subsp. *acutiloba* and it appears that Ker-Gawler thought that this yellow flowered form was in fact *S. bulbifera*. (Bot. Mag. t. 545). This yellow flowered form from the Olifants River valley has been misidentified as *S. bulbifera* since Baker (1878), but the stems never branch nor does it produce numerous cormlets, and *S. bulbifera* itself never has yellow flowers.

6. *S. grandiflora* (da La Roche) Ker., in Kon. & Sims Ann. Bot. 1: 225 (1804) et Gen. Irid.: 94 (1827); Ecklon, Top. Verz.: 27 (1827); Klatt in Linnaea 32: 748 (1863); Baker in Linn. Soc. Bot. 16: 98 (1878) pro parte excl. var *stellaris* Sweet et var *lineata* Sweet; Bak., Handbk. Irid.: 197 (1892) et Fl. Cap. 6: 116 (1896); Marloth, Fl. S. Africa 4: 148 (1915) pro parte excl. var *liliago*; Lewis in Adamson & Salter, Fl. Cap. Pen.: 245 (1950) pro parte excl. plantae florum maculatum. *Ixia grandiflora* de La Roche, Dissert. Descript. Pl. Nov.: 23 (1766); Burmann, Prod. Fl. Cap.: 1 (1768); Ker. in Bot. Mag.: t. 541 (1804); D.C. in Red. Lil.: t. 362 (1813).—Neotype: Goldblatt 303 (BOL) *I. uniflora* L., Mant.: 27 (1770); Houtt., Nat. Hist. 12: 22 (1780); Jacq. Ic. Pl.: t. 238 (1793).—Holotype: Lin. Herb. 58/19. "*I. aristata*" sensu Ait., Hort. Kew ed. ii. 1: 57 (1789) non Thunb. (1783); Willd., Sp. Pl. 1: 203 (1798); Pers., Syn. Pl. 1: 47 (1805); *I. aristata* var *atropurpurea* Ker. in Andr., Bot. Rep. 2: t. 87 (1797). *Belemcanda aristata* (Ait.) Moench, Meth. Suppl.: 214 (1802). *Ixia holosericea* Jacq., Hort. Schoen.: t. 17

(1797).—Iconotype: Jacq. Hort. Schoen.: t. 17. *Sparaxis atropurpurea* Klatt, Erganz.: 55 (1882).—Lectotype: Zeyher 516 (LUB).

Corm, globose, 0.6–1.5 cm in diameter, tunics of fine white fibres. *Stem* firm, glabrous, erect, simple 8–45 cm high, 1, 2 or occasionally 3 in number, bearing a few cormlets in the lowest axils only. *Leaves* 6–10, distichous, ensiform, lanceolate or falcate, 0.4–1.3 cm broad, usually fairly short but from 3–30 cm long, acute, acuminate, or obtuse acuminate. *Spike* lax 1–6 flowered. *Bracts* dry, firm, scarious, usually marked with brown streaks especially on margin, rarely uniformly white, deeply lacerated, apices forming 1–3 long cusps which are straight or slightly twisted and entire; *bracteoles* similar but smaller, 2-cusped. *Flowers* zygomorphic, dull or brightly coloured, either marked or not; *perianth tube* yellow, purple or black, 1.0–1.4 cm long, the narrow portion 0.3–0.5 cm long; *perianth segments* uniformly cream coloured or marked with black blotches at the base or marked externally with broad purple stripes, or uniformly red-purple, violet-purple or yellow with or without dark spots and or streaks, lanceolate to ovate, or spatulate, sub-acute or obtuse, 2.4–3.0 cm long, 1.2–1.6 cm broad. *Stamens* white or yellow, asymmetrically disposed, the anterior stamen recurved to lie against the posterior segment; *filaments* curved, 0.7–0.9 cm long, *anthers* facing inwards and slightly curved, somewhat longer than the filaments. *Ovary* ovoid; *style* white or yellow, usually reaching almost to the apex of the anther, recurved and lying behind the stamens against the posterior perianth lobe; *branches* filiform, curved and from 0.6–1.0 cm long. *Capsule* small, globose, firmly membranous; *seeds* fairly numerous and round. *Chromosome number* $2n = 20$.

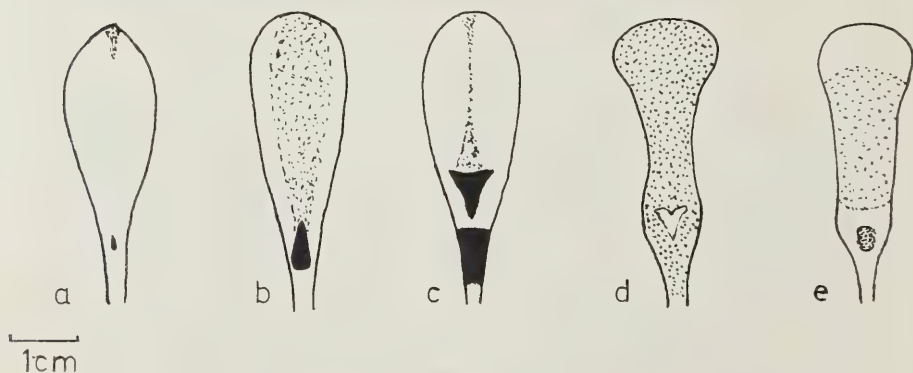


FIG. 3.

Perianth segments of a, *S. grandiflora* subspecies *acutiloba*; b, and c, of subsp. *fimbriata*; d, of subsp. *grandiflora*; e, of subsp. *violacea*.

S. grandiflora and its subspecies occur on damp flats or hilly slopes, from the Caledon area to the Olifants river valley.

Flowering time: August—September.

This species is complex and consists of four distinct subspecies, all of which differ from one another in one or more characters. In addition, each of the sub-species is confined to a particular geographical area, separated by mountain barriers. Intermediates are not known in nature but all the subspecies are interfertile.

KEY TO THE SUB-SPECIES

- | | |
|--|-----------------------|
| 1. Perianth segments spatulate | |
| 2. Leaves lanceolate, sometimes curved, acuminate and lightly ribbed; flowers frequently red-purple, sometimes white; occurring in the Tulbagh valley..... | a. <i>grandiflora</i> |
| 2'. Leaves broadly falcate, obtuse-acuminate and strongly ribbed; flowers light purple or white; occurring in the Caledon area..... | c. <i>violacea</i> |
| 1'. Perianth segments lanceolate to ovate | |
| 3. Segments broadly lanceolate and acute; flowers yellow or purple.... | d. <i>acutiloba</i> |
| 3'. Perianth segments ovate and obtuse; flowers cream coloured, marked with purple | b. <i>fimbriata</i> |

6a. Subsp. *grandiflora*

Plants less robust than in the other subspecies. *Leaves* 6—20 cm long, 1 cm broad, lanceolate and acuminate or acute, lower leaves somewhat falcate. *Flowers* usually deep red-purple, white and sometimes marked with light purple; *perianth tube* yellow, red purple outside; *perianth segments* 2·5—3·0 cm long 0·8—1·4 cm broad, spatulate and obtuse.

Damp, clay flats and slopes in Tulbagh valley between Tulbagh and Artois.

Flowering time: September.

Icones: Ker., in Bot. Mag.: t. 541 (1804) as *Ixia grandiflora*; Ker., in And. Bot. Rep. 2: t. 87 (1797) as *I. aristata* var *atropurpurea*; Jacq., Hort. Schoen.: t. 17 (1797) as *I. holosericea*; Marloth. Fl. S. Africa 4: pl. 43 E.

CAPE—3319 (Worcester): Artois (Tulbagh) (—AD), *Compton* 11677 (NBG); Tulbagh, *Ecklon & Zeyher* 111 (SAM); Artois, *Esterhuysen* 6080 (BOL); near Tulbagh Road Station, *Goldblatt* 303 (BOL); Tulbagh, *Grant* 2470 (PRE); 2 miles south Tulbagh, *Lewis* 5741 (NBG); Steendaal, Tulbagh, *MacOwan* 583 (BOL, SAM), *Pappe s.n.* (SAM 48516); Tulbagh Kloof, *Stokoe and Davis s.n.* (SAM 63511).

This subspecies is distinguished by its distinctly spatulate petals. The majority of plants are a deep red-purple colour but pure white and intermediate

individuals are not rare. It is extremely localised, being known only from the Tulbagh valley.

S. grandiflora was described by de La Roche in his doctoral thesis published in 1766. The type is, however, unknown. La Roche mentioned that he obtained specimens of many species from several people including Linnaeus, but he did not indicate any more than this. It does seem that his description was based on a pressed specimen(s) as the corm is not discussed. N. E. Brown (1929) has suggested that the type of *Ixia monathos*, another species described by La Roche in the same work, is in the Burmann Herbarium, Geneva. This specimen does match La Roche's description closely, and the handwriting on this sheet is thought to be his, but there does not seem to be an inscription in a similar hand on specimens of *S. grandiflora*. Thus there does not seem to be more than the flimsiest circumstantial evidence that the type of *S. grandiflora* is in Burmann's collection.

In the absence of further evidence a neotype is proposed. There is little doubt that La Roche's description applies to the Tulbagh form as he describes the flowers as large and deep violet and the perianth segments as dilated at the tip (i.e. spatulate). It is these very features which serve to distinguish this sub-species. *S. grandiflora* was long considered to include both the purple and white flowered forms, one or another of which was often listed as a variety.

6b. Subsp. **fimbriata** (Lam.) Goldblatt comb. nov. et stat. nov.

Ixia fimbriata Lam., Encyc. 3: 339 (1789). *Sparaxis fimbriata* (Lam.) Ker. in Kon. & Sims, Ann. Bot.: 225 (1805) Basionym.—Iconotype: Mill. Dict. Fig. Pl. 237, f. 1, 2. *Ixia liliago* D.C. in Red. Lil.: t. 109 (1804). *Sparaxis liliago* (D.C.) Sweet, Hort. Brit. ed. 2.: 501 (1830); Klatt, Ergänz.: 56 (1882). *S. grandiflora* var *liliago* (D.C.) Ker. in Bot. Reg.: t. 258 (1817); Baker in Journ. Lin. Soc. Bot. 16: 99 (1878).—Iconotype. Red. Lil. t. 109. "*S. grandiflora*" sensu Bak., Handbk. Irid.: 197 (1892) pro parte excl. plantae florum purpurearum; Bak., Fl. Cap. 6: 116 (1896) pro parte excl. plantae florum purpureorum; Lewis in Adamson & Salter Fl. Cap. Pen.: 245 (1950) pro parte excl. plantae florum sine maculata. *S. grandiflora* var *striata* Sweet, Hort. Brit. ed ii: 501 (1830).—Iconotype: Ker., in Bot. Mag.: t. 779. "*S. anemonaeflora*" sensu Ecklon. Top. Verz.: 27 (1827).—Lectotype. Ecklon 763 (PRE).

Plants usually very robust. *Leaves* seldom up to 20 cm long, usually less than 10 cm, the flowers borne well beyond the leaves, the leaves ensiform or falcate, acuminate or obtuse acuminate when falcate. *Flowers* zygomorphic, distinctly marked; *perianth tube* bright yellow, purple outside; *perianth segments* cream to pale yellow with fairly large black blotches at the base and streaked externally

with broad purple marks so that unopened flowers are purple or lightly marked at the base and not purple streaked externally, narrowly ovate, obtuse 2·8—4·0 cm long, 1·4—1·6 cm broad.

Fairly damp clay flats and hills round Cape Town, and northwards as far as Darling, Piketberg and Porterville areas.

Flowering time: August—September.

Icons: Miller. *Ic. Pl. t. 237 fig. 2.* (1760) as *Ixia sp.*; Redoute, *Lil. t. 109* (1805) as *I. liliago*; Ker., in *Bot. Mag. t. 779* (1804) as *S. grandiflora* var.

CAPE—3218 (Clanwilliam): near Piketberg (—CD), *H. Bolus s.n.* (BOL 29582); Piketberg, *Compton 15007* (NBG)

—3318 (Cape Town): Hopefield (—AB), *Marloth 10598* (PRE); Darling (—AC), *Engelbrecht s.n.* (BOL 29584); Modder River turnoff, Darling Road, *Goldblatt 300* (BOL); near Porterville (—BB), *Barker 5846* (NBG); north of Wellington (—CB), *Goldblatt 302* (BOL); Paarl, *Hutchinson 466* (NBG); Elsenberg (—CC), *Grant 2514* (PRE); Bottelary Road, Bellville, *Lewis 2240* (SAM); Stellenbosch flats, *Mauve 4575* (PRE); southern outskirts of Paarl, *Story s.n.* (PRE 30485); Stellenbosch, *Strey 495* (PRE); Welgemoed, Bellville (—CD), *Loubser 2110* (BOL); Mamre Hills (—DB) *Barker 1344* (NBG); Groenekloof, *H. Bolus 4344* (BOL); *Zeyher 779* (SAM); Signal Hill (—DC), *Barker 453* (NBG), *Wilms 3755* (Z), *Wolley-Dod 579* (BOL); Lions Head, *Ecklon 763* (PRE, Z), *MacOwan s.n.* (BOL 29583, SAM, 21311), *Thode 9173, 2212, 12873* (H.U.S.); Blinkwater, *Rehmann 1300* (Z),

—3319 (Worcester): Dal Josaphat (—DA), *Grant 2346* (PRE),

—3418 (Simonstown): Faure (—BB); *Barker 2986* (BOL); Hottentots Holland, *Ecklon 113* (SAM); Faure flats *Hutchinson 497* (PRE, BOL).

DOUBTFUL LOCALITIES

—3219 (Wupperthal): Olifants River Valley, *Leipoldt s.n.* (BOL 29583); Wupperthal (—AD), *MacOwan s.n.* (SAM 21312).

—3319 (Worcester): Tulbagh, *Ecklon & Zeyher s.n.* (PRE 22348).

This subspecies is distinguished from subsp. *grandiflora* and the other subspecies by the shape of the perianth segments which are narrowly ovate and obtuse. The colour and markings of the flower are also distinctive, being cream to pale yellow with small or large black blotches at the base of the segments, having narrow or broad external purple streaks down the centre of the lobe in most populations and a yellow perianth tube. Populations from the Mamre-Darling area have the narrowest purple streaks and smallest internal blotches.

This is most frequently confused with *S. bulbifera* as the flowers of both

species are whitish to pale yellow. The markings and shape of the perianth segments are distinct even if the peculiar features of *S. bulbifera*, namely the branching and the cormlets, are not apparent. It is probably due to this confusion that subsp. *fimbriata* has a rather involved taxonomy.

It may be discovered later that *Ixia sparsa* Miller is the earliest name for this subspecies. Lamarck lists this as a synonym of *I. fimbriata* and also gives two of Miller's figures as types. The description of *I. sparsa* is unfortunately quite inadequate to place it even in the genus *Sparaxis*, nor is there a type in the British Museum, where Miller's types are housed. If the figures which are the type of subsp. *fimbriata* can in some way be linked to *I. sparsa* then this will be a synonym.

6c. subsp. **violacea** (Ecklon) Goldblatt stat. nov. et. comb. nov.

Sparaxis violacea Ecklon, Top. Verz.: 27 (1827) Basionym. Klatt Ergänz.: 55 (1882). "*S. bulbifera* var *violacea*" sensu Baker, Handbk. Irid.: 197 (1892) et Fl. Cap. 6: 116 (1896).—Lectotype. *Ecklon & Zeyher 114* (SAM).

Plants not robust, usually short and rarely up to 20 cm high. *Stem* unbranched. *Leaves* up to 8 cm but often less, 0·6—1·2 cm broad, closely ribbed, falcate and obtuse-acuminate, rarely acuminate. *Flowers* zygomorphic; *perianth tube* yellow or cream; *perianth segments* white with or without violet marks at the base, and sometimes streaked externally, or violet with white at the base and apex, spatulate and obtuse, 2·2—2·6 cm long, 1·2 cm broad.

Damp clay flats in the Caledon district from Botriver and Villiersdorp to Riviersonderend and Napier.

Flowering time: August—September.

CAPE—3519 (Caledon): Botriver Caledon (—AA), *Ecklon & Zeyher 114* (SAM); 16 miles north of Botriver, *Goldblatt 295* (BOL); 6 miles south Villiersdorp on Caledon Road, *Salter 4786* (BOL); lower slopes Houw Hoek, *Walgate 1081* (SAM); lower slopes Houw Hoek, *Wilman 840* (BOL); Zwartberg, Caledon (—AB), *Ecklon & Zeyher 115* (SAM, PRE); 1 mile south of Caledon, *Goldblatt 300* (BOL); Drayton siding, east of Caledon (—BA), *Goldblatt 334* (BOL); between Lindeshof and Greyton; *Lewis 5662* (NBG); Appelpkraal, Riviersonderend (—BB), *Ecklon & Zeyher s.n.* (SAM 21304); Fairfield, near Bredasdorp (—BC), *Lewis 5283* (NBG).

This subspecies may be recognised by its slightly spatulate perianth segments, short, comparatively broad, closely ribbed leaves which are almost invariably falcate and obtuse acuminate. The perianth segments are either

uniformly white or marked with violet near the base, or are violet fading to white at the base and apex.

It is spread through the Caledon area and appears to share the same ecological niche as *S. fragrans* but the two have not been observed growing together. It is clearly part of the *S. grandiflora* complex, but is geographically isolated from the other subspecies, and differs in flower colour and form.

It is perhaps rather inaptly named, as the flower colour in several populations, especially east of Caledon, is pure white.

6d. Subsp. **acutiloba** Goldblatt, subsp. nov.

"*Ixia bulbifera*" sensu Ker. in Bot. Mag.: t. 545 (1801). "*S. bulbifera*" sensu Baker in Linn. Soc. Bot. 16: 98 (1878) pro parte, sole ad plantas florum luteorum refert; Bak., Handbk. Irid.: 197 (1892) et Fl. Cap. 6: 115 (1896).? *Ixia monathos* de La Roche, Dissert. Descript. Pl. Nov.: 21. (1766);? *Sparaxis monathos* (de La Roche) N. E. Brown in Kew Bull. 4: 135 (1924).—? Type. *Burmamn s.n.* (G).? *Sparaxis lutea* Ecklon, Top. Verz.: 28 (1827) uterque pro parte sole ad plantas florum luteorum refert.

Ab aliis subspeciebus perianthii segmentis acutis et lanceolatis distinguitur.

Plantae saepe graciles et elatae sed interdum parvae. *Caulis* 1—3 (numero) 8—45 cm longa, gracilior, glabra. *Folia* 7—10, erecta ensiformia, 5—30 cm longa. *Flores* zygomorphae; *perianthii tubus* luteus; *segmenta* lutea, interdum nigra maculata vel striata externe, vel segmenta purpurea, lanceolata et acutae, raro subobtusae, 2·4—2·9 cm longa, 1·2 cm lata.

Distinguished from the other varieties by its smaller flowers the segments of which are lanceolate and acute, occasionally narrowly obtuse. When growing under favourable conditions this is the tallest of the subspecies.

Plants are fairly tall and slender reaching to 45 cm in height, but sometimes much smaller. *Stem* 8—45 cm high, comparatively slender, glabrous, 1—3 in number. *Leaves* 7—10, erect, ensiform acuminate, 5—30 cm long. *Flowers* zygomorphic, brightly coloured; *perianth tube* yellow; *perianth segments* bright yellow, sometimes spotted or striped externally with black, or flowers purple, lanceolate and acute or sub-obtuse, 2·4—2·9 cm long, 1·2 cm broad.

Damp clay banks and hills in Olifants River Valley extending from Warmbaths to Clanwilliam and as far as Vredendal, where a purple form occurs.

Flowering time: August—September.

Icones: Ker., in Bot. Mag.: t. 545 (1801) as *Ixia bulbifera*.

CAPE—3218 (Clanwilliam): Clanwilliam (—BB), *Guthrie* 3356 (BOL); Clanwilliam, *Loubser* 940 (NBG); 1 mile from Alpha on Algeria Road (—BC), *Gillet* 4133 (BOL); 8 miles south Clanwilliam *Goldblatt* 264 (BOL); 18 miles south Clanwilliam, *Goldblatt* 263 (BOL); Alpha, *Hugo* s.n. (BOL 29589); 10 miles north Citrusdal, *Lewis* 1344 (SAM); between Clanwilliam and Citrusdal, *Lewis* s.n. (BOL 20308); Olifants River Valley, *Schelchter* 4990 (BOL, Z), *Penther* 681, 610 (Z),

—3219 (Wupperthal): 5 miles north Citrusdal (—DA), *Barker* 3606 (NBG), *Compton* 20764 (NBG). *Leighton* 1095 (BOL); 6 miles north Citrusdal, *Barker* 7397 (NBG); Warmbaths, *Leipoldt* s.n. (BOL 29588).

DOUBTFUL LOCALITY

—3318 (Cape Town): Malmesbury (—BD), *Blinkiron* s.n. (NBG 63037).

Although this subspecies has been known for many years it has long been mistakenly referred to *S. bulbifera*. It may be the plant which Ecklon called *S. lutea* but this name is excluded as the description is inadequate. As yet, the type of *S. lutea* has not been located.

GEOGRAPHICAL DISTRIBUTION

The genus is confined to the South Western Cape. Except for *S. bulbifera*, each species or subspecies has a very local distribution. The least specialised species, namely *S. tricolor*, *S. pillansii* and *S. elegans*, have the most limited range, occurring in a small area on the Nieuwoudtville plateau. These three species of *Sparaxis* can perhaps be regarded as relicts, having evolved in this small area from once far more widespread ancestors. The remaining actinomorphic species, *S. fragrans*, is also localised and occurs over a portion of the Caledon area.

Both the zygomorphic species have a wide range. The *S. grandiflora* complex is widespread although some of the sub-species have a limited distribution. Subsp. *violacea* is found in the northern part of the Caledon area, subsp. *acutiloba* in the Olifants River Valley, subsp. *grandiflora* in the Tulbagh valley and subsp. *fimbriata*, by far the most widespread, along the coastal belt from Piketberg to Cape Town. These areas are all separated from one another by mountain barriers rising about 500 feet above the valleys or plains on which the plants grow. It is not only altitude which serves as a barrier for these lowland forms, but the soil, for the mountains consist, in part at least, of sandstone and sandy soil, in contrast to the heavy clay on which all but one species of *Sparaxis* grow. It is possibly a combination of unsuitable soil and rapid drainage which limits the growth of *S. grandiflora* on these mountain regions, for as mentioned previously, all the species grow in places which are damp or water-logged during the winter growing season. It seems that *S. grandiflora* is a species evolving into

several new forms, a process promoted by isolation and consequent limitation of gene exchange, and by somewhat different climatic conditions in each area.

S. bulbifera, the most widespread species, occurs from the Piketberg to the Bredasdorp areas. The distribution of this species is not limited by soil type as it will grow on clay or sandy soil. The mountain ranges seem to present little barrier to its distribution. The species is found from near sea level to just above 1,000 ft in the Elgin area and around Caledon.

HYBRIDISATION

Very little critical work has been done on the breeding of *Sparaxis* or the related genus *Synnotia*. Interspecific *Sparaxis* hybrids have, however, been recorded on several occasions and all of the species seem to be interfertile. A few intergeneric crosses have been successfully made. The author has crossed *Sparaxis tricolor* and *Synnotia variegata* with no noticeable reduction in seed production or viability. Loubser (personal communication) has also crossed the two genera and has raised a sturdy hybrid generation.

Many of the garden forms of *Sparaxis* are interspecific hybrids, and these are almost all fertile and are usually more vigorous than the parental forms. From the few reports available it seems that hybrids of *S. tricolor* and *S. elegans* have been raised (L. Bolus 1932b) and *S. pillansii* is a suspected parent of several hybrid forms. The author has crossed *S. tricolor* with *S. elegans*, and reciprocally crossed *S. elegans* and *S. grandiflora* subspecies *acutuloba*. Fertility was not noticeably reduced, and the offspring of the latter cross are vigorous though they have not yet flowered.

Breeding work has been carried out at the Bienne Donne Experimental Farm at Groot Drakenstein by Horn (1962) and is still being maintained. There is a very large number of forms at Bienne Donne, some of which are triploid and higher polyploids. Several of these hybrids closely resemble species which were described early in the nineteenth century and confirm the suspicion that these were in fact hybrids. Among those which were previously recognised as distinct species or synonyms of other species are:—

<i>S. blanda</i>	Sweet	Hort. Brit. ed. ii: 501 (1830)
<i>S. griffini</i>	Sweet	Hort. Brit. ed. ii: 501 (1830)
<i>S. lineata</i>	Sweet	Br. Fl. Gard. ser. ii: t. 131 (1832)
<i>S. stellata</i>	Roem. & Schult	Syst. Veg. ed. i. 1: 400 (1817) as <i>Ixia stellata</i>
<i>S. versicolor</i>	Sweet	Br. Fl. Gard. ser. i: t. 160 (1826).

The first four are clearly related to *S. tricolor* and the last seems to be a hybrid of *S. tricolor* and *S. grandiflora* subsp. *grandiflora*.

The breeding experiments of Horn indicate that *Sparaxis* is usually cross

fertilised, as naturally or artificially selfed flowers showed much reduced fertility. Whether the crosses were performed between the same or other species made no difference to the fertility.

DISCUSSION

Cytology

It must be pointed out that the literature on the cytology of the South African Iridaceae is rather scanty. The author is, however, engaged on research in this field and although nothing has as yet been published, some comments can be made with authority.

The chromosome number of 20 (diploid) is found in at least eight genera including the group of genera under discussion. This number is also found in some species of *Moraea* and *Dietes* (Sakai 1952; Fernandez and Neves 1961; Sharma and Sharma 1961), in *Chasmanthe aethiopica* and in the genus *Micranthus*. In *Moraea* and *Dietes* the chromosomes are larger than those of *Sparaxis* by a factor of about 100 and have a remarkably different appearance. *Chasmanthe* has uniformly small chromosomes, while in *Micranthus* there is a single pair of conspicuously large ones and the others are small.

From the authors knowledge and from the existing papers on the subject it can be said that the diploid number of 20 is the only number occurring in species of *Dierama* and *Ixia*. (Darlington and Wylie 1950, Brittingham 1934, Fernandez and Neves 1951). This is also true of *Sparaxis* and *Synnotia* (Brittingham 1934). Together with the similarity in karyotype, this is probably indicative of the close relationship of these four genera. That *Sparaxis* and *Synnotia* both have smaller chromosomes than *Dierama* and *Ixia*, may also be significant, for Stebbins (1950) has pointed out that decreasing chromosome size can often be correlated with more advanced morphological features and the corresponding specialization.

Phylogeny and Evolution

Both cytological and morphological evidence seem to indicate that the *Dierama*, *Ixia*, *Sparaxis*, *Synnotia* complex are a natural group. As mentioned earlier *Dierama* is the most primitive of the group as it has the least specialized characteristics; evergreen habit (in most), branched inflorescence, persistent corms, a short perianth tube and regular flowers. It also has the widest geographic distribution. As Lewis (1962) pointed out, *Ixia* may have evolved from *Dierama* due to the more taxing ecological conditions prevailing in the South Western Cape. The smaller, short-living corm, deciduous habit and reduced size are probably far better adapted to the long, dry, hot summers and wet winter and short spring period occurring in this area.

Sparaxis and *Synnotia* may have evolved independently from *Dierama* and

although the bracts are rather less modified than *Ixia*, floral specialization has occurred. The end result of this line is the strongly zygomorphic flowers of *Synnotia*.

DOUBTFUL AND EXCLUDED SPECIES

A list of doubtful and excluded species has been compiled from the long list of names published under *Sparaxis*. Most belong to other genera but a few are species of doubtful affinity. A small list of hybrid species and garden forms is provided under the section dealing with hybridization.

S. anemonaeflora (Jacq.) Ker.

This species was described by Jacquin as *Ixia anemonaeflora*. It is clearly not a *Sparaxis* as it lacks the characteristic bracts. Lewis (1962) in her revision of *Ixia* stated that this plant (Jacq. Ic. Pl.: .273) is *I. campanulata* Houtt., which it resembles very closely.

The plant described by De Candolle in Red. Lil.: t. 85 as *I. anemonaeflora* is a *Sparaxis* and this has led to confusion in the application of the name. This name is however illegitimate.

S. bicolor (Thunb.) Ker.

Sweet placed this species in the genus *Synnotia* which he established in 1826. It differs from *Sparaxis* in having a longer, curved, perianth tube, arcuate unilateral stamens, and a hooded posterior perianth segment. All these characters serve to distinguish *Sparaxis* from *Synnotia*. The plant is now known as *Synnotia villosa* (Burm. f.) N. E. Brown.

S. galeata (Jacq.) Ker.

This plant, originally described as a *Gladiolus* (Jacq. Ic. Pl. t. 258) is *Synnotia galeata*. It was placed in this genus in 1826 by Sweet, for the same reasons as was the previous species.

S. herbertii Hort. nom. nud.

This manuscript name only appears on herbarium specimens and was apparently never validated. Klatt cited it in the synonymy of *Freesia xanthospila* when he described this species. The drawing in the Bolus Herbarium of this specimen in the Berlin Herbarium shows clearly that it is a *Freesia*, as it has the typical long, broad perianth tube and short lobes. This specimen was made the type of *Freesia herbertii* N. E. Brown (1930).

S. joubertii Lodd. nom. nud.

This is another species which was never described under this name. It was first listed in Delect. H. Dresden. (1813—1835) and is mentioned in Walpers Ann. Bot. 6: 49 (1861). According to N. E. Brown (1930) there is a specimen

in the Vienna Herbarium which bears the name *S. joubertii*, and the later name *Freesia xanthospila* Klatt. It is now recognised as *F. xanthospila* (D.C. in Red.) Klatt.

The name *S. jaubertii* which appeared in a seed catalogue of the Vienna Botanic gardens (Del. Sem. Hort. Vindob. 1885) is a misspelling of *S. joubertii*.

S. lacera Ker., nom. nud.

Specimens bearing the name *Ixia lacera* are in the Linnaean Herbarium (58/18 and 58/19). The name is, however, not valid as the specimens were never described under this epithet, but Ker. (1805) correctly placed it in *Sparaxis*. The specimens are probably *S. grandiflora* subsp. *fimbriata*.

S. lineata (Salisb.) Pax in Engl. & Prantl. Pflanzenf. ii. 5: 155 (1899) non Sweet (1832).

This plant, originally described as *Gladiolus lineatus* by Salisbury (1796) was *Ixia squalida* var. B of Aiton, Hort. Kew ed. i. 1: 61. This species was later placed in *Tritonia* by Ker. (1805), and it is *Tritonia lineata* (Salisb.) Ker. It has flattened corms with brown tunics and characteristic firm leaves of *Tritonia*.

S. luteoviolacea Ecklon, Top Verz. 27 (1827) nom. nud.

This species was not described but merely listed in Ecklon's chapter on *Sparaxis*. There are, however, specimens of this species and Lewis (1956) recognised it as *Synnotia variegata* Sweet var. *metelerkampiae*. (L. Bol.) Lewis.

S. miniata Klatt, Erganz. 55 (1882).

This species is something of a mystery. From Klatt's description the salient points of the plant are: lower leaves, one, ribbed, grass-like and linear; flowers two, these vermilion with yellow base, spaced far apart; bracts white, membranaceous with brown, deeply lacerate cusps; exerted perianth tube and ovate segments. The description was based on a specimen of Drège (5968), without locality, which was in Klatt's Herbarium. This collection was housed in Berlin, and is believed to have been destroyed. Unless another specimen can be located it is doubtful whether the identity of the species can be determined.

From colour alone it may be *S. tricolor*, a species already recognised by Klatt, or it may be *S. pillansii* perhaps a species of *Tritonia* e.g. *T. hyalina*.

S. monanthos (de La Roche) N. E. Brown in Kew Bull. 4: 135 (1924).

This was described by de La Roche (1766) as *Ixia monanthos*. From the description it is clearly allied to *S. grandiflora* but it is equally clear that it is not quite like any of the subspecies described in this paper. As it is yellow (*luteus*) it seems allied to the subspecies *acutiloba*, but no specimen of this is known with the fairly large black mark in the middle of the segments that de La Roche mentions.

A specimen with this name is in the Herb. Delessert Geneva, in Burmann's collection. According to N. E. Brown (1929) the inscription is in de La Roche's handwriting and is in fact the type. Whether this is so or not, the specimen matches the description very closely. There is however, no indication in de La Roche's thesis as to where his types are, if indeed there was one of this species.

The present author's opinion is that this species is allied to *S. grandiflora* subsp. *acutiloba*, though it may be a garden hybrid or an unusual form of the subspecies.

S. orchidiflora Lodd. Bot. Cab. 7: t. 1099 (1825). nom. subnud.

The plant concerned is *Synnotia variegata* Sweet var. *metelerkampiae* (L. Bol.) Lewis. It has the typical features of *Synnotia* mentioned under *S. bicolor*.

S. pendula (L.f.) Ker.

The genus *Dierama* was based on this species and the plant is now *D. pendulum* (L.f.) Baker. This genus is related to *Sparaxis* but differs in having a slender pendulous stem, much branched inflorescence and evergreen leaves.

S. pulcherrima (Hook. f.) in Bot. Mag.: t. 5555 (1866).

This is another species now referred to *Dierama*, for the same reasons as the previous species. It is now *Dierama pulcherrimum* (Hook. f.) Bak.

S. reflexa nom. nud.

This is another undescribed species, and it has not been illustrated. It was listed by Voigt in a catalogue of the Calcutta Bot. Gardens in 1845. The name was obtained from an M. S. of Villet and it is not possible to identify the plant upon which the name was based.

S. thoubertii nom. nud.

This name was used in horticultural circles during the mid 19th century, but never validated. Eventually the plant was described by Klatt in 1874, and published as *Freesia leichtlini* in Gartenflora p. 289: this is now known as *F. xanthospila* (D.C.) Klatt var. *leichtlini* (Klatt) N. E. Brown.

S. wattii Harvey in Gen. S.A. Pl. 330 (1838).

The type is in Trinity College Herbarium, Dublin and is unmistakably *Synnotia variegata* Sweet, though the description given by Harvey is inadequate.

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